

U.S. Serial No. 10/771,562

Listing of Claims:

Please amend the claims as follows.

Claim 1 (cancelled).

Claim 2 (cancelled).

Claim 3 (currently amended). An optical switch comprising:

a single optical input for accepting an optical signal;

an active deflecting element responsive to a control system to deflect said optical signal in a selected one of a plurality of directions, where said deflecting element comprises an electro-optical material and at least one two pairs of electrodes on opposite sides of said electro-optical material;

a common waveguide to accept an optical signal deflected into any one of said plurality of directions;

a plurality of optical outputs, where each of said plurality of optical outputs corresponds to one of said plurality of directions, and where each of said plurality of optical outputs comprises passive optics to accept said optical signal deflected in one of said plurality of directions and propagated through said common waveguide,

where said deflection of said optical signal to said selected one of said plurality of directions provides switching of said optical signal to a corresponding one of said plurality of optical outputs, and

wherein each electrode of said at least one two pairs of electrodes is of similar shape, and wherein the optical path of said optical signal passes between each of said at least one pair of electrodes.

Claim 4 (cancelled).

Claim 5 (cancelled).

Claim 6 (cancelled).

U.S. Serial No. 10/771,562

Claim 7 (currently amended). An optical switch comprising:

a single optical input for accepting an optical signal;

an active deflecting element responsive to a control system to deflect said optical signal in a selected one of a plurality of directions, where said deflecting element comprises an electro-optical material and at least ~~one~~ two pairs of electrodes on opposite sides of said electro-optical material;

a common waveguide to accept an optical signal deflected into any one of said plurality of directions;

a plurality of optical outputs, where each of said plurality of optical outputs corresponds to one of said plurality of directions, and where each of said plurality of optical outputs comprises passive optics to accept said optical signal deflected in one of said plurality of directions and propagated through said common waveguide,

where said deflection of said optical signal to said selected one of said plurality of directions provides switching of said optical signal to a corresponding one of said plurality of optical outputs, and

wherein said common waveguide has a face having a plurality of facets each adjacent to one of said plurality of optical outputs and perpendicular to said corresponding one of said plurality of directions.

Claim 8 (currently amended). An optical switch comprising:

a single optical input for accepting an optical signal;

an active deflecting element responsive to a control system to deflect said optical signal in a selected one of a plurality of directions, where said deflecting element comprises an electro-optical material and at least ~~one~~ two pairs of electrodes on opposite sides of said electro-optical material;

a common waveguide to accept an optical signal deflected into any one of said plurality of directions;

a plurality of optical outputs, where each of said plurality of optical outputs corresponds to one of said plurality of directions, and where each of said plurality of optical outputs comprises passive optics to accept said optical signal deflected in one of said plurality of

U.S. Serial No. 10/771,562

directions and propagated through said common waveguide;

where said deflection of said optical signal to said selected one of said plurality of directions provides switching of said optical signal to a corresponding one of said plurality of optical outputs; and

wherein said common waveguide propagates said deflected optical signal in a corresponding one of a plurality of waveguide directions, wherein said common waveguide has a waveguide output adjacent said plurality of optical outputs, and wherein said waveguide output is approximately perpendicular to said plurality of waveguide directions, such that said optical signal is not significantly refracted when exiting said common waveguide.

Claim 9 (currently amended). An optical switch comprising:

a single optical input for accepting an optical signal;

an active deflecting element responsive to a control system to deflect said optical signal in a selected one of a plurality of directions, where said deflecting element comprises an electro-optical material and at least ~~one~~ two pairs of electrodes on opposite sides of said electro-optical material;

a common waveguide to accept an optical signal deflected into any one of said plurality of directions;

a plurality of optical outputs, where each of said plurality of optical outputs corresponds to one of said plurality of directions, and where each of said plurality of optical outputs comprises passive optics to accept said optical signal deflected in one of said plurality of directions and propagated through said common waveguide;

where said deflection of said optical signal to said selected one of said plurality of directions provides switching of said optical signal to a corresponding one of said plurality of optical outputs; and

wherein each of said passive optics includes a lens and an output waveguide, and wherein said passive optics have an optical axis perpendicular to said waveguide output and the input of said output waveguide.

Claim 10 (cancelled).

U.S. Serial No. 10/771,562

Claim 11 (currently amended). An optical switch comprising:

- a single optical input for accepting an optical signal;
- an active deflecting element responsive to a control system to deflect said optical signal in a selected one of a plurality of directions, where said deflecting element comprises an electro-optical material and at least ~~one~~ two pairs of electrodes on opposite sides of said electro-optical material;
- a common waveguide to accept an optical signal deflected into any one of said plurality of directions;
- a plurality of optical outputs, where each of said plurality of optical outputs corresponds to one of said plurality of directions, and where each of said plurality of optical outputs comprises passive optics to accept said optical signal deflected in one of said plurality of directions and propagated through said common waveguide;
- where said deflection of said optical signal to said selected one of said plurality of directions provides switching of said optical signal to a corresponding one of said plurality of optical outputs; and

wherein said optical switch is a hybrid switch and wherein the material through which the optical path of said optical signal through said single optical input, said common waveguide, and said plurality of optical outputs differs from the electro-optical material of said active deflecting element.

Claim 12 (cancelled).

Claim 13 (cancelled).

Claim 14 (currently amended). An optical switch module to switch an optical signal from an input fiber to a selected one of a plurality of output fibers comprising:

- a single optical input to accept the optical signal from the input fiber;
- optical elements to direct said optical signal to a selected one of a plurality of outputs each optically coupled to one of said plurality of output fibers, where said optical elements comprise:

a collimating element to collimated said optical signal,

U.S. Serial No. 10/771,562

an active deflecting element to accept said collimated optical signal and deflect said optical signal responsive to a control system in one of a plurality of directions corresponding to a one of said plurality of outputs, where said deflecting element comprises an electro-optical material and at least two one pairs of electrodes on opposite sides of said electro-optical material,

a common waveguide having a waveguide input to accept said optical signal deflected by said active deflecting element and a waveguide output, and a focusing element at said plurality of optical outputs comprising passive optics focus said optical signal from said common waveguide into said selected one of said plurality of outputs, and

wherein each electrode of said at least two one pairs of electrodes is of similar shape, and wherein the optical path of said optical signal passes between each of said at least one pair of electrodes.

Claim 15 (cancelled).

Claim 16 (cancelled).

Claim 17 (cancelled).

Claim 18 (currently amended). An optical switch module to switch an optical signal from an input fiber to a selected one of a plurality of output fibers comprising:

a single optical input to accept the optical signal from the input fiber;
optical elements to direct said optical signal to a selected one of a plurality of outputs each optically coupled to one of said plurality of output fibers, where said optical elements comprise:

a collimating element to collimate said optical signal,
an active deflecting element to accept said collimated optical signal and deflect said optical signal responsive to a control system in one of a plurality of directions corresponding to a one of said plurality of outputs, where said deflecting element comprises an electro-optical material and at least one two pairs of electrodes on opposite

U.S. Serial No. 10/771,562

sides of said electro-optical material,

a common waveguide having a waveguide input to accept said optical signal deflected by said active deflecting element and a waveguide output, and a focusing element at said plurality of optical outputs comprising passive optics focus said optical signal from said common waveguide into said selected one of said plurality of outputs, and

wherein said common waveguide has a face having a plurality of facets each adjacent to one of said plurality of optical outputs and perpendicular to said corresponding one of said plurality of directions.

Claim 19 (currently amended). An optical switch module to switch an optical signal from an input fiber to a selected one of a plurality of output fibers comprising:

a single optical input to accept the optical signal from the input fiber;

optical elements to direct said optical signal to a selected one of a plurality of outputs each optically coupled to one of said plurality of output fibers, where said optical elements comprise:

a collimating element to collimate said optical signal,

an active deflecting element to accept said collimated optical signal and deflect said optical signal responsive to a control system in one of a plurality of directions corresponding to a one of said plurality of outputs, where said deflecting element comprises an electro-optical material and at least one two pairs of electrodes on opposite sides of said electro-optical material,

a common waveguide having a waveguide input to accept said optical signal deflected by said active deflecting element and a waveguide output, and a focusing element at said plurality of optical outputs comprising passive optics focus said optical signal from said common waveguide into said selected one of said plurality of outputs, and

wherein said common waveguide propagates said deflected optical signal in a corresponding one of a plurality of waveguide directions, wherein said common waveguide has a waveguide output adjacent said plurality of optical outputs, and wherein said waveguide output is approximately perpendicular to said plurality of waveguide directions, such that said optical

U.S. Serial No. 10/771,562

signal is not significantly refracted when exiting said common waveguide.

Claim 20 (currently amended). An optical switch module to switch an optical signal from an input fiber to a selected one of a plurality of output fibers comprising:

a single optical input to accept the optical signal from the input fiber;

optical elements to direct said optical signal to a selected one of a plurality of outputs each optically coupled to one of said plurality of output fibers, where said optical elements comprise:

a collimating element to collimate said optical signal,

an active deflecting element to accept said collimated optical signal and deflect said optical signal responsive to a control system in one of a plurality of directions corresponding to one of said plurality of outputs, where said deflecting element comprises an electro-optical material and at least one two pairs of electrodes on opposite sides of said electro-optical material,

a common waveguide having a waveguide input to accept said optical signal deflected by said active deflecting element and a waveguide output, and a focusing element at said plurality of optical outputs comprising passive optics focus said optical signal from said common waveguide into said selected one of said plurality of outputs, and

wherein each of said passive optics includes a lens and an output waveguide, and wherein said passive optics have an optical axis perpendicular to said waveguide output and the input of said output waveguide.

Claim 21 (cancelled).

Claim 22 (currently amended). An optical switch module to switch an optical signal from an input fiber to a selected one of a plurality of output fibers comprising:

a single optical input to accept the optical signal from the input fiber;

optical elements to direct said optical signal to a selected one of a plurality of outputs each optically coupled to one of said plurality of output fibers, where said optical elements comprise:

U.S. Serial No. 10/771,562

a collimating element to collimate said optical signal,
an active deflecting element to accept said collimated optical signal and deflect
said optical signal responsive to a control system in one of a plurality of directions
corresponding to one of said plurality of outputs, where said deflecting element
comprises an electro-optical material and at least one two pairs of electrodes on opposite
sides of said electro-optical material,

a common waveguide having a waveguide input to accept said optical signal
deflected by said active deflecting element and a waveguide output, and a focusing
element at said plurality of optical outputs comprising passive optics focus said optical
signal from said common waveguide into said selected one of said plurality of outputs,
and

wherein said optical switch is a hybrid switch and wherein the material through which the
optical path of said optical signal through said single optical input, said common waveguide, and
said plurality of optical outputs differs from the electro-optical material of said active deflecting
element.

Claim 23 (previously presented). The optical switch of claim 3 wherein at least some of said
electrodes are gold.

Claim 24 (previously presented). The optical switch of claim 3 wherein said optical switch
comprises a silicon substrate.

Claim 25 (previously presented). The optical switch of claim 7 wherein said optical switch
comprises a silicon substrate.

Claim 26 (previously presented). The optical switch of claim 8 wherein said optical switch
comprises a silicon substrate.

Claim 27 (previously presented). The optical switch of claim 9 wherein said optical switch
comprises a silicon substrate.

U.S. Serial No. 10/771,562

Claim 28 (previously presented). The optical switch of claim 11 wherein said optical switch comprises a silicon substrate.